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SUBJECT: RWANDA ENERGY REVIEW - ENERGY INDEPENDENCE BY  
2015? -

11. (U) Summary: With economic development strangled by the high cost of imported energy, the Government of Rwanda (GOR) has embarked on an ambitious plan of domestic energy independence maximizing use of alternative energy sources. The government is aggressively promoting hydroelectric power and development of technologies to use methane gas from Lake Kivu for power generation and production of synthetic fuels. Geothermal energy, solar power, peat and biogas energy are also being explored as possible energy sources. Recent breakthroughs in methane gas extraction and construction of new hydroelectric projects promise to provide Rwanda with energy independence by 2015. End summary.

12. (U) Diesel thermal generators currently provide over 55 percent of Rwanda's 65MW minimum power needs. The GOR was forced to turn to rented thermal generators in 2002-2004 when four hydroelectric plants, constructed between 1959 and 1985, failed due to drought and poor maintenance. The high cost of petroleum (which has doubled over the last year) is compounded by the unreliability and expense of transporting diesel by truck from Kenya via Uganda or from Tanzania. With Rwandan electricity costs now the highest in the region, existing businesses are struggling to remain competitive and new investors are turning away discouraged by high energy costs. Niobium Mining Company in Kigali discontinued tin smelting operations in 2006 due to expensive and unreliable energy supply, according to management.

Land of a Thousand Hydro Plants  
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13. (U) The GOR has responded by aggressively promoting new hydroelectric projects and exploring other alternative energy sources. Although hydroelectric energy is sensitive to drought, Rwanda's hilly geography (the country is known as "the land of a thousand hills") is favorable to hydro exploitation and during normal rainfall conditions it is the most economical source of energy available to the country. New hydroelectric facilities under construction at Nyabarongo and Rukarara are expected to generate 37MW of power by 2012. Feasibility studies are also underway at three additional sites at Rusomo and Rusizi that could provide up to 320MW of power. Efforts to promote micro-hydro power production are well-advanced. The GOR has identified 333 potential sites

with a total potential of 100MW. Twenty-one of these projects have been funded and are expected to add 13MW to the national grid by 2010.

#### Methane: Use it Before it Kills You

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¶4. (U) On May 15th, a government funded \$15 million pilot project extracted and "flared" methane gas from Lake Kivu. This is the first time this extraction technology has been successfully tested anywhere in the world. Lake Kivu has estimated reserves of 55 million cubic meters of methane gas trapped below 400 feet. The methane has been slowly accumulating at the bottom of the lake over thousands of years. Scientists say that if the methane is not vented it could burst to the surface releasing a poisonous cloud (similar to the one that erupted from Cameroon's Lake Nyos in 1986 killing 1,700 people). The GOR estimates Lake Kivu's methane reserves could yield up to 350MW of energy annually to Rwanda for the next 50 years. When completed next month, a small power plant connected to the pilot project will use methane to generate 5MW of power for the national grid. By 2012, the government believes methane-to-power production will reach 80MW.

¶5. (U) Investors are now scrambling to sign methane concessions with the GOR. American company Contour Global is near to signing a concession for a 100MW gas-to-power facility in Kibuye, local Rwanda Investment Group (RIG) is also negotiating a 100MW concession in conjunction with the Agha Khan foundation in Kenya, and a German group (W&S) hopes to sign a 50MW concession with the GOR within the next 6

months. Additionally, a number of investors including the U.S. Rwanda Energy Company are bidding on a gas-to-liquid (GTL) project producing up to 2,000 barrels daily of synthetic diesel and/or aviation fuel produced from methane gas.

#### Geothermal: There's Energy in Them There Hills

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¶6. (U) Based on studies conducted by the U.S Geographical Energy Association and the French Bureau de Recherche Geologique et Minieres (BRGM), the World Bank believes Rwandan geothermal resources could potentially provide 150-300MW to the Rwandan national grid. The German government is currently funding a geo-scientific assessment to evaluate the geothermal power generation potential in northwest Rwanda between the Virunga national park and the Lake Kivu town of Gisenyi. The Kenya Electricity Company is also exploring geothermal opportunities in Cyangugu (southwest Rwanda) and hopes to sign an MOU with the GOR this year to drill exploratory production wells.

#### Solar: It's Free if You Can Afford the Technology

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¶7. (U) In June 2007, German company Stadtwerke Mainz AG, inaugurated the first phase of a 250KW solar power plant on Mount Jali just outside Kigali. The solar plant, the largest in Africa, uses American photovoltaic technology and will be expanded in several phases to produce up to 1MW of electricity. Engineers from Stadtwerke Mainze explained the Rwandan climate is favorable to solar power and noted the Mount Jali facility is 40 percent more efficient than similar facilities in Germany. Until now, the high cost of solar power plants relative to output has been a disincentive to larger solar energy facilities. However, rising petroleum costs and the declining cost of photovoltaic cells could make this technology more attractive in the near future. Stadtwerke Mainze hopes to use the facility on Mount Jali as a model to implement smaller scale solar energy projects in rural areas (outside the national electrical grid) to provide power to schools, health and administrative centers.

#### Biogas and Peat: Great for Cooking

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¶8. (U) Rwanda has estimated reserves of 155 million tons of peat which the government hopes can be exploited for use in heavy industry and as an alternative cooking fuel. The largest Rwandan cement factory - Cimerwa located in Cyangugu - is in the process of converting its equipment to use peat as an energy source and expects to be 80 percent dependent on peat energy by October 2008. RIG is also evaluating a project to compress peat into briquettes as an alternative to charcoal for domestic cooking needs.

¶9. (U) Households constitute the largest energy consumers in the country and about 95 percent of household energy demand is met by biomass (typically wood and charcoal). This has contributed to the over-exploitation of forests and resulted in a reduction of natural forest cover by two thirds since the 1950's. In addition to using peat as an alternative cooking source, the GOR is promoting the use of biogas. With Qcooking source, the GOR is promoting the use of biogas. With the support of the Dutch and German governments, the GOR is implementing a National Domestic Biogas Program (NDPE) which will distribute 15,000 biogas digesters to rural households by 2011. The biogas digesters fed by animal and human waste will provide rural households with a renewable supply of biogas for cooking and lighting.

¶10. (U) Comment: Rwanda's Economic Development and Poverty Reduction Strategy (EDPRS) sets a clear roadmap to expand energy diversification, security and domestic access. Under the plan, the GOR hopes to increase installed power generation capacity from 60MW to 165MW by 2012. While this power generation is relatively small scale, it will help

satisfy the country's short-term energy needs. The GOR appears to be well-positioned to achieve this goal and could well surpass it. If energy projects in the pipeline are realized, Rwanda could be energy independent by 2015.

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